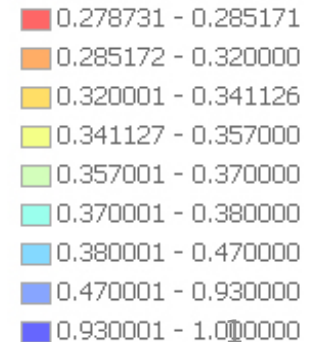


FASST

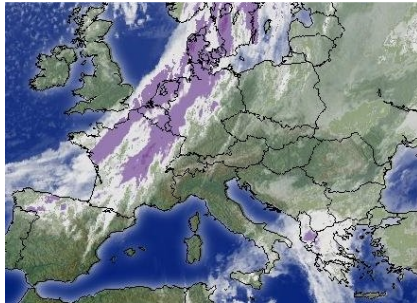
Fast All-season Soil STrength

**S. Frankenstein
ERDC - CRREL**



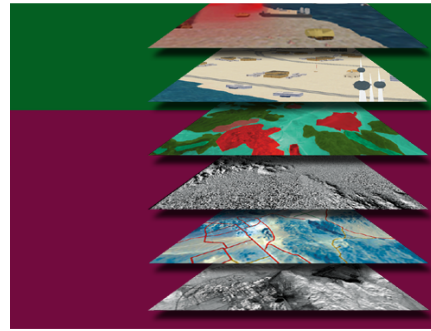
Physics Based Modeling Approach

**Wx /
Atmospheric
(Dynamic State)**



**AFWA - MM5/WRF
Measured - similar to Army & AF
battlefield obs**

**Terrain
Features**

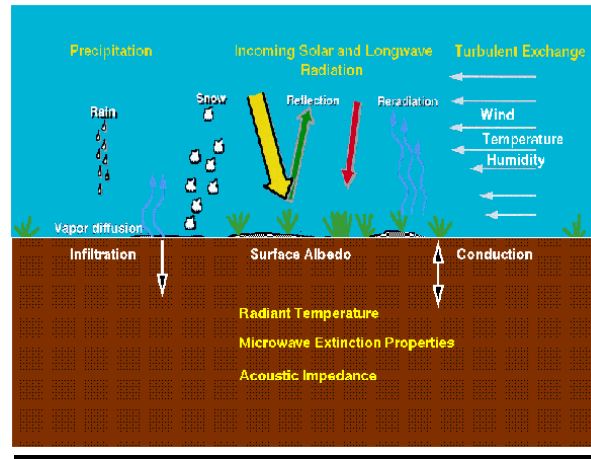


**VITD, VMAP,
Measured**

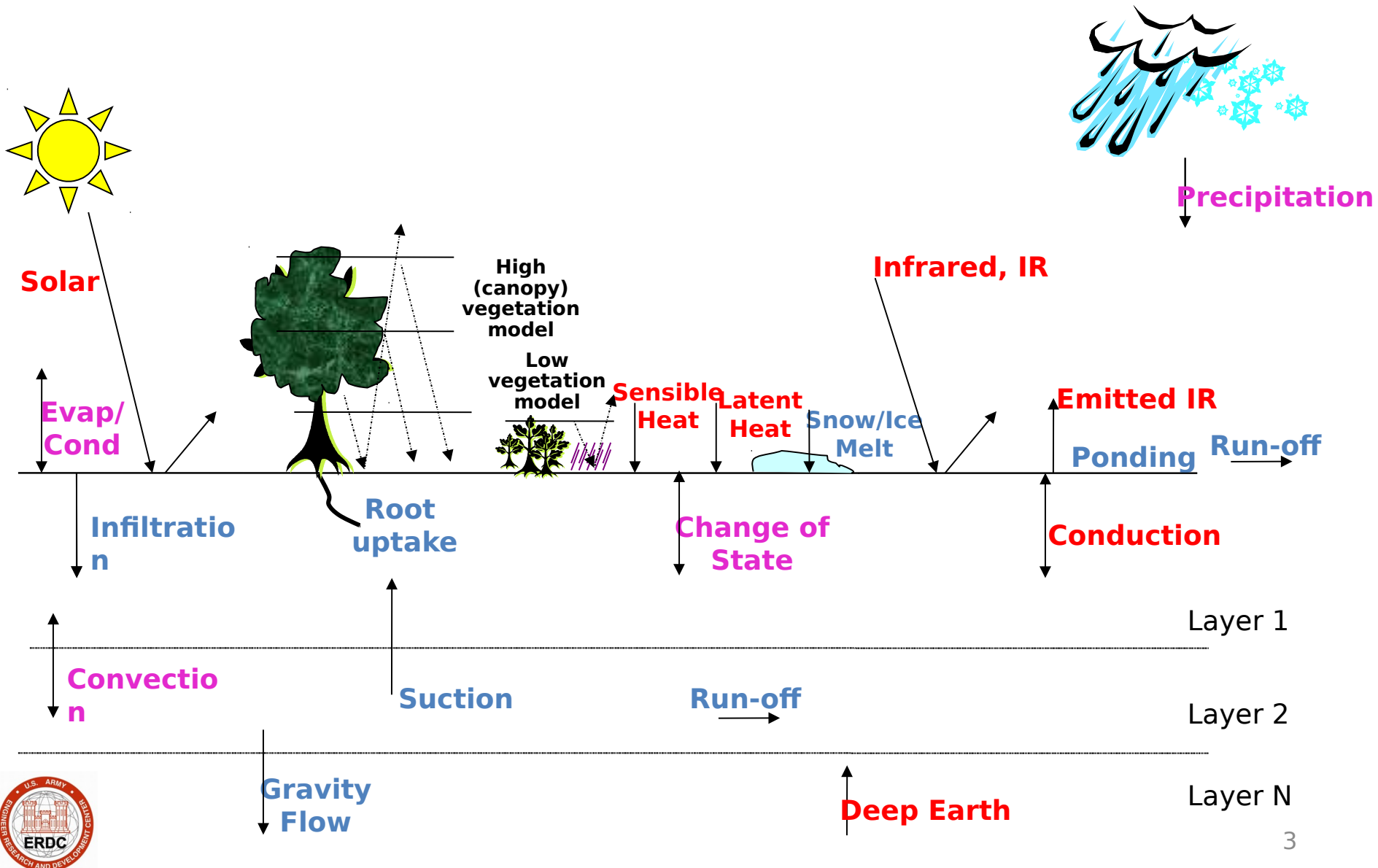
Terrain Complex

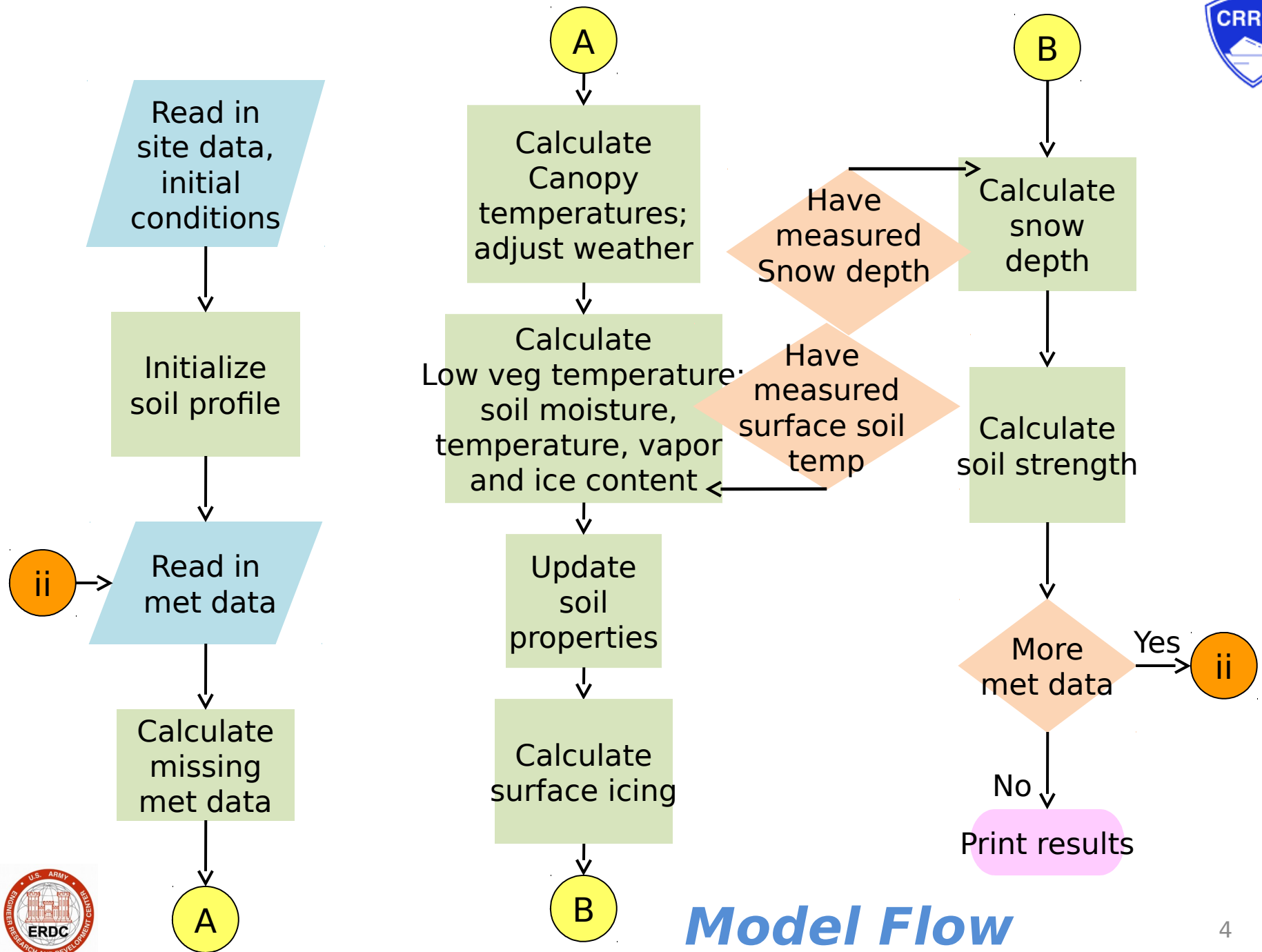


**State-of-the-Ground
(FASST - Fast All-
season Soil
STrength)**



FASST Water & Energy Balance





Model Flow

Inputs:

- Meteorological Data (Dynamic)
 - WRF forecast at best resolution (AFWA)
 - Available Weather Observations → AF Combat Wx Team, Army MET upper air, Army tactical obs network
 - Initial Snow Depth & Density, Ice Thickness
- Soil Data (Static)
 - Number of Layers, Layer Thickness & Type
 - Initial Moisture & Temperature Profile
 - Layer material properties (density, porosity, conductivities...)
- Vegetation Data (Static)
 - Type – High and/or Low (classifications based on BATS)
 - Density, Height
- Site Specifics (Static)
 - Latitude, Longitude, Elevation, Slope, Aspect
 - Time offset from GMT

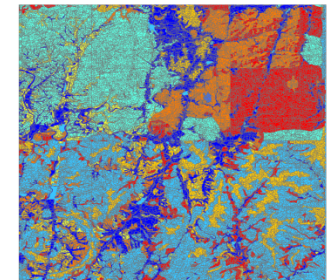
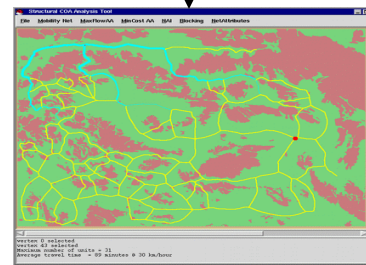
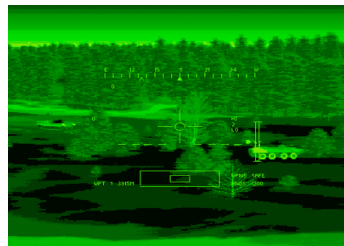
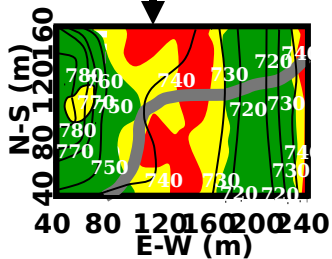
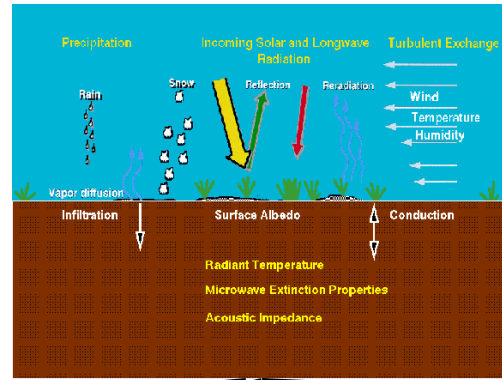
Outputs:

- Soil Temperature
- Soil Moisture – volumetric & gravimetric
- Ice Content
- Vapor Content
- Freeze/Thaw Depth
- Surface State (Frozen/Thawed)
- Snow Depth & Density
- Surface Ice Thickness
- Vegetation Temperatures
- Surface Energy Fluxes
- Mobility specific
 - Surface Slippery Factor (Wet/Dry/Snow/Ice)
 - Soil Strength (CI, RCI and CBR)

Down-stream Feeds and Uses



State-of-the-Ground



Sensor Performance Product (RSPd, SPEBE)
IR Target-Scene Simulation (IRTSS),
AER, ARL, C/JMTK, USAF Air Maneuver
10th Mountain, BTRA, Battle Lab, BTRA-BC,
BTRA-BC

Mobility Planning/Route Generation (NRMM/STDMOB)
DTSS, DCGS-A, GSL, TEC, BTRA, C/JMTK, State DOT

Dynamic State
NASA, CSU, NPS, SMEX, JRAC, OLS, C/JMTK, CHL, DTSS, NCAR, NOAA, DCGS-A, BTRA, BTRA-BC, JIEDDO, LIS, IWEDA, TAWS



